

REMARKS

Claims 1-2 and 4-8 are pending in the present application.

Claim 3 has been cancelled without prejudice or disclaimer to the subject matter contained therein.

I. ARGUMENTS

A. Objection to the Drawings

The drawings have been objected for various reasons. These objections are respectfully traversed in view of the above-submitted amendments to the Specification and drawings.

As submitted above, the specification has been amended to clarify the function of reference item 30 of Figure 2 and its relationship to the source 12 of Figure 2. More specifically, the specification has been amended to indicate that reference item 30 of Figure 2 is an outlet that allows the neutron flux to flow out of the source 12. The support for this feature is illustrated by items 154 and 156 of Eggers (US-A-5,392,319), Eggers having been incorporated by reference in the originally filed specification, wherein the neutron flux flows out of the source through an outlet on the non-bombarded side of the surface of the target material. Moreover, Eggers shows that the coolant material flows out the opening 58 that surrounds the conduit carrying the cooled coolant back into the neutron source assembly.

Moreover, Figure 1 has been amended to show the connection between the check valve and the reservoir. Figure 2 has been amended to identify the source (12) and the outlet thereof (30).

No new subject matter has been added in these amendments.

Accordingly, in view of the amendments and remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw these objections to the drawings.

B. Objection to the Specification

The specification has been objected for various reasons. This objection is respectfully traversed in view of the above-submitted amendments to the specification and claims.

As submitted above, the specification has been amended to indicate that reference item 30 of Figure 2 is an outlet that allows the neutron flux to flow out of the source. The support for this feature is illustrated by items 154 and 156 of Eggers (US-A-5,392,319), Eggers having been incorporated by reference in the originally filed specification, wherein the neutron flux flows out of the source through an outlet on the non-bombarded side of the surface of the target material. Moreover, Eggers shows that the coolant material flows out the opening 58 that surrounds the conduit carrying the cooled coolant back into the neutron source assembly.

No new subject matter has been added in these amendments.

Accordingly, in view of the amendments and remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw this objection.

C. Rejections of Claims 1, 2, and 4 - 8 under 35 U.S.C. §103

Claims 1, 2, and 4-8 have been rejected under 35 U.S.C. §103 as being unpatentable over Eggers (US-A-5,392,319) in view of Lidsky et al. (US-A-5,784,423), and Alger et al. (US-A-4,141,224). This rejection is respectfully traversed.

As submitted above, independent claim 1 has been amended to set forth a method of cooling a low Z target material of a neutron source assembly, comprising providing, by using a nozzle submerged in liquid gallium, a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of the low Z target material to cool the low Z target material.

Moreover, independent claim 5 has been amended to set forth a neutron source assembly having a liquid cooled target comprising an accelerator based neutron source including a low Z target material that is bombarded by accelerated particles to produce a neutron flux and a cooling system to circulate liquid gallium through the accelerator based neutron source to cool the low Z target material. The cooling system includes a nozzle, the nozzle being submerged in liquid gallium, to provide a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of the target material.

Lastly, independent claim 8 has been amended to set forth a liquid cooling system for a neutron source assembly, said cooling system comprising a reservoir of liquid gallium; a heat exchanger in fluid connection with the reservoir of liquid gallium; a nozzle, the nozzle being submerged in liquid gallium, to provide a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of a low Z target material within the neutron source assembly; and means for circulating the liquid gallium between the reservoir of liquid gallium, the heat exchanger and the neutron source assembly to remove heat from a neutron generating low Z target material within the neutron source assembly.

As recognized by the Examiner, Eggers and Lidsky et al., singly or in combination, fail to disclose the use of a nozzle to provide a concentrated flow of liquid gallium in a direction normal to a non-bombarded surface of the target material as set forth in amended independent claims 1, 5, and 8.

With respect to the teachings of Alger et al., Alger et al. discloses a non-submerged nozzle (29) that extends outwardly with respect to the target material (11). Moreover, Alger et al. discloses that the nozzle is positioned above the liquid coolant, not submerged therein, in an environment of inert gas or atmospheric gases. The positioning of the nozzle above or without the liquid coolant allows Alger et al. to generate the desired spray properties, namely the maintaining of a gaseous bubble around the sprayed liquid coolant. Thus, Alger et al. fails to disclose or suggest the use of a nozzle submerged in liquid gallium to provide a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of the target material, as set forth in amended independent claims 1, 5, and 8.

Since Alger et al. fails to disclose or suggest the use of a nozzle submerged in liquid gallium to provide a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of the target material and the combination of Eggers and Lidsky et al. fails to disclose the use of a nozzle submerged in liquid gallium to provide a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of the target material, the proposed combination of Eggers, Lidsky et al., and Alger et al. fails to disclose or suggest the use of a nozzle submerged in liquid gallium to provide a submerged jet of concentrated liquid gallium in a direction normal to a non-bombarded surface of the target material, as set forth in amended independent claims 1, 5, and 8.

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Accordingly, in view of the amendments and remarks set forth above, the Examiner is respectfully requested to reconsider and withdraw this rejection.

CONCLUSION

Accordingly, in view of all the amendments and reasons set forth above, the Examiner is respectfully requested to reconsider and withdraw all the present rejections. Also, an early indication of allowability is earnestly solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Matthew E. Connors", is written over a horizontal line.

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In the Drawings

Please replace originally filed Figures 1 and 2 with the attached replacements.